The Repetition-Break Plot Structure: A Cognitive Influence on Selection in the Marketplace of Ideas

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Abstract

Using research into learning from sequences of examples, we generate predictions about what cultural products become widely distributed in the social marketplace of ideas. We investigate what we term the Repetition-Break plot structure: the use of repetition among obviously similar items to establish a pattern, and then a final contrasting item that breaks with the pattern to generate surprise. Two corpus studies show that this structure arises in about a third of folktales and story jokes. An experiment shows that jokes with this structure are more interesting than those without the initial repetition. Thus, we document evidence for how a cognitive factor influences the cultural products that are selected in the marketplace of ideas.

Keywords: Cultural selection; Surprise; Plot structures; Structural alignment; Repetition; Folktales; Jokes

1. Introduction

As Sperber (1996) noted, ''To explain culture… is to explain why and how some ideas happen to be contagious'' (p. 1). Given the array of cultural ideas that produce surprise—ghosts, werewolves, talking cats, folktales with surprising twists, jokes with surprise endings—it is reasonable that many researchers have investigated the role that surprise plays in creating contagious cultural ideas. The dominant approach to surprise has been to examine counterintuitive items; things and events that violate people's deeply engrained intuitions held because of evolutionary pressures to understand physical, animal, and human environments. For example, Boyer and Ramble (2001) noted that many religious traditions

feature supernatural beings that are surprising because they violate people's intuitions about the properties of natural kinds. Ghosts have many of the characteristics of people—they have thoughts and desires and emotions—but they violate two key properties: unlike people, ghosts can move through physical objects and they can exist eternally. Researchers have found that narratives with these kinds of counterintuitive elements are more memorable (Barrett & Nyhof, 2001; Norenzayan, Atran, Faulkner, & Schaller, 2006; Upal, Gonce, Tweney, & Slone, 2007) and degrade at lower rates than narratives composed of elements that are intuitive and less surprising (Norenzayan & Atran, 2004).

We too examine cultural practices and products that have evolved to induce surprise. But we examine cultural products that can produce surprise even though people have no fundamental intuition about them. Instead, we focus on cultural products that recur because they leverage universal cognitive psychological mechanisms to teach people novel expectations and then violate them to produce surprise.

For example, the well-known children's story ''The Three Little Pigs'' features three events in close succession. One pig builds a straw house that a wolf blows down by huffing and puffing. A second pig builds a stick house, which the wolf also destroys by huffing and puffing. The third pig builds a brick house, which the wolf fails to topple even after a great deal of huffing and puffing. The third event—the failure of the wolf to topple the brick pig house—provides a small jolt of surprise, despite the fact that the first time we heard the story we had no strong intuition about what happens when wolves huff and puff at pig houses. This simple children's story has produced surprise *endogenously*, by mechanisms internal to the story itself. The surprise occurs on the fly—we have no biologically provided intuition about wolves and pig houses, nor do we have pre-existing schemas about wolves and pig houses that formed through repeated cultural experience outside the boundaries of this story.

In this paper, we suggest that some cultural products can leverage how people learn from examples to reliably foster endogenous surprise. As we will document, both schema and category learning research show that novices notice similarities across examples and use the similarities to generate expectations about subsequent examples. Learning research has emphasized that when people form such expectations they are better able to acquire and use categories and schemas; in this paper we emphasize that such expectations make people susceptible and attentive to new kinds of surprises. Surprise is an emotion designed to interrupt ongoing information processing, seize attention, and free up cognitive resources to evaluate whether the unexpected event is relevant to ongoing activities (Meyer, Reisenzein, & Schützwohl, 1997). We suggest that ''The Three Little Pigs'' is a cultural product that exploits these information-processing tendencies to aid its propagation. There are probably no useful life consequences that arise from understanding interactions between wolves and pig houses; the story succeeds by being surprising and entertaining. We examine whether the plot structure we identify is used in two different domains of culture—folktales and jokes. Our claim is that surprise-based selection is even more important than we might guess from previous literature. Surprising cultural products will arise not only to capitalize on existing expectations but will also create novel ones. Thus, we are using cognitive science research in new ways to predict what will be a successful cultural product.

We also highlight another advantage of surprise that has not been considered in previous literature. Surprise not only makes things more memorable, it can also make them more likeable and interesting. If culture is the product of ''cognition and communication'' (Sperber, 1996), then previous research has focused on the role of ''cognition''—why counterintuitive beliefs might be more memorable. We highlight the role of ''communication'': surprise makes things more interesting and likeable, and those kinds of things are likely to be preferred when people communicate with others.

1.1. Understanding endogenous surprise: The Repetition-Break plot structure

''The Three Little Pigs'' creates surprise because it first establishes, then violates, a novel pattern. Jokes often use similar strategies for creating surprise (cf. Sacks, 1992). A common joke form has three people walking into a bar or standing at the gates of heaven. One version of the ''gates of heaven'' plot describes two cabdrivers and a priest standing at the gates. The first cabdriver enters heaven and is richly rewarded, the second cabdriver enters and is even more richly rewarded, then the priest enters and receives little. This pattern of events poses a puzzle: Why are cabdrivers favored and priests not? When the priest asks about this discrepancy, St. Peter responds: ''We reward results. In your sermons, people slept; in their cabs, people prayed.''

There are two key commonalities in ''The Three Little Pigs'' and the joke about cabdrivers and a priest that make up the two parts of the Repetition-Break plot structure. Both story and joke set up an expectation by *repeating* a basic event with only slight variation. Because the events are highly similar, listeners are likely to compare them. Comparison then focuses listeners on the common features of the initial events and leads them to generate an expectation about the subsequent event. The second commonality is that they *break* the pattern set by the initial repetition with a final contrasting event. The break is surprising because it is unexpected given the immediately preceding pattern. We term this combination the Repetition-Break plot structure. It provides a general recipe for structuring information in a way that generates surprise. Research in cognitive science can explain what Repetition-Break plots do and why they work.

Research into category and schema learning suggests that when similar items are juxtaposed, people can be induced to compare them. Category learning research shows that people compare examples to generate an understanding of the category of which they are members (e.g., Ross, Perkins, & Tenpenny, 1990). People learn categories more effectively when examples from the same category appear together (Clapper & Bower, 1994), suggesting that making it easier to notice commonalities across examples is important. People also learn categories more effectively when they first see multiple central members of the category (Avrahami et al., 1997), suggesting people expect that initial commonalities will accurately represent subsequent items (see also Zhang & Markman, 1998).

Research into schema learning also suggests that people learn better when they can compare similar examples (Elio & Anderson, 1984). When people are asked to compare examples, they tend to focus on commonalities (Gick & Holyoak, 1983) and give particular

weight to higher-level relationships among the elements (Gentner, 1983). Most people do not spontaneously compare examples that have a common relational structure but no obvious surface commonalities (i.e., analogies; Gick & Holyoak, 1980; Loewenstein, Thompson, & Gentner, 1999). But when surface similar items are juxtaposed, people are likely to compare them spontaneously, and this in turn can produce inferences and expectations that are more sophisticated than the surface bases on which they were made.

Key research into learning from highly similar examples comes from cognitive development, and specifically Gentner's research into ''progressive alignment'' (Gentner, Loewenstein, and Hung, 2007; Kotovsky & Gentner, 1996; Namy & Gentner, 2002). For example, Loewenstein and Gentner (2001) showed that spontaneous comparisons between surface similar examples allowed children to draw spatial analogies. Preschool children were first shown toy dogs who hid dog bones in either one dollhouse or in two dollhouses that differed only in color (a difference that preschool children find easy to bridge). Children were then asked to find another toy dog bone hidden ''in the same place'' in a third analogous dollhouse (items were of the same category and in the same relative positions, but were differently shaped, which is a difference preschool children find more challenging to bridge). Although the second, highly similar dollhouse may seem to offer no important new information, children were better able to find the hidden bone if they saw two similar dollhouses initially rather than one. This is because the similarity prompted a comparison, which focused children's attention on a precise commonality. Thus, novices' spontaneous comparisons between highly similar items lead them to generate nonobvious expectations about subsequent examples.

Combined, the research into schema and category learning suggests implications for understanding narratives. When people hear plots that present multiple highly similar events in succession, they should be likely to draw comparisons between them and as a result attend to their common structure. They should then generate expectations that subsequent events will have the same structure. Showing that the Repetition-Break plot is widespread in cultural products would suggest that the principles of category and schema learning that have been described by previous researchers are sufficiently reliable and robust that they can be counted on to drive home the point of a children's folktale or the punch line of a joke.

The Repetition-Break plot structure follows the Repetition phase with a pronounced Break. We have long known that distinctive or deviant information is memorable (as in von Restorff's isolation effect; von Restorff, 1933). And research supports the idea that people are more likely to be interested in an event that surprises them by violating their expectations. There are good reasons why people should attend to and remember surprises. Surprises suggest that people's schemas of the world are incomplete (e.g., Schank, 1982), and thus they tend to evoke both cognitive and emotional mechanisms that encourage people to pay close attention (Meyer, Reisenzein, & Schützwohl, 1997). A meta-analysis showed that people remember situations when their expectations are violated more than situations which were consistent with expectations (Rojahn & Pettigrew, 1992), and the more prominent the expectation, the more likely people are to remember an instance in which it was violated (Sakamoto & Love, 2004).

The Break part of the Repetition-Break plot should have substantial effects on attention and memory, but we suggest that it can also make the plot structure as a whole more interesting and likeable. Although there is less previous literature to draw on to make the liking prediction, the literature that does exist supports the notion that surprises amplify people's liking of pleasant events (Mellers, 2000). Thus, we posit that endogenous surprise will increase liking of entertaining folktale plots and jokes.

Endogenous surprise should increase liking for a joke or folktale the first time someone encounters it, but there is also reason to believe it can have more enduring effects. Research into narratives has shown that stories can create ''anomalous suspense'' even for well-known endings (Gerrig, 1998). For example, if people read a passage about the Titanic and the story highlights an event that is inconsistent with the well-known ending—e.g., that the captain was not worried when the ship hit the iceberg—people become slower to recognize well-known events like the ship sinking even though they know at some level that the Titanic is doomed. Gerrig's research suggests that stories can direct our attention in a way that heightens emotional reactions even when an emotion probably would not occur if we attended to everything we know. Similarly, we argue that the Repetition in the Repetition-Break plot is well suited to direct our attention by setting up a stable schema that leads us to be surprised when the schema is reversed by the Break.

If people are going to react to a surprising experience with liking, we suggest that it is important that it not only be unexpected, but that it relate meaningfully to what came before. The Repetition-Break plot not only generates surprise, it does so at the end of a sequence of events, at which point it can offer resolution and thereby create a coherent story. For example, perhaps the most famous text that uses the Repetition-Break structure is the opening of *Genesis*: the Creator creates on each of six successive days, and on the seventh, surprisingly, takes a break. Although research into deviant events suggests that such events will be noticed regardless of where in a sequence they occur (e.g., Sakamoto & Love, 2004), we suggest it is no accident that the Break often happens at a climactic point in a story or at the punch line of a joke. We think the appearance of a deviant event at the end helps to make the story interesting and likeable as a whole. Repetition-Break is a *plot* structure, and the plot organizes the various occurrences so that the Break plays a particular role in the story. That role is not only to surprise, but to make the story interesting and likeable by leading people to re-interpret the events that have gone before. This means the surprise generated by the Break should make sense after the fact. It should not be predictable but postdictable, as suggested by prior research and theorizing (cf. Suls, 1983; Whittlesea & Williams, 1998). In our studies we will examine whether the Repetition-Break plot structure does indeed lead to greater surprise and liking.

Our first task in this research was to document the prevalence of the Repetition-Break plot structure. There are many ways that stories could conceivably generate surprise, so it could be that the Repetition-Break plot is not widely used; indeed, we have been unable to find any prior discussions of it as a generic form. If the Repetition-Break plot is common in two different natural settings, folktales and jokes, it would provide strong evidence for the role that endogenously created surprise plays in the selection and perpetuation of cultural products. And if the Repetition-Break plot can be relied upon to create endogenous surprise, this reinforces the cultural importance of the basic mechanisms that have been described by

laboratory studies of category and schema learning. To be clear, we are suggesting that stories with the Repetition-Break plot are likely to recur in cultures because the plot structure takes advantage of basic cognitive and affective processes—comparison and surprise—with which people are universally endowed. Accordingly, we first document the prevalence of the Repetition-Break plot in corpuses of folktales and jokes.

In the second part of the paper, we experimentally test whether the Repetition-Break plot structure increases liking. We focus on the key novel component of the plot structure, which is the endogenous creation of a novel expectation. We take advantage of the fact that jokes are compact and easily manipulated to embody or avoid the Repetition-Break plot. Thus, we manipulate jokes and test whether the Repetition-Break plot is indeed valued more by people than jokes without the initial repetition.

2. Study 1: Corpus analysis of folktale plot structures

Some folktales such as ''The Three Little Pigs'' and ''The Three Billy Goats Gruff'' use the Repetition-Break plot,[1] but how widespread is it? The canonical Western source of folktales was compiled by the Grimm brothers in the early 1800s and published in final form in 1856. It includes classic tales such as ''Rapunzel,'' ''Hansel and Gretel,'' ''Cinderella,'' ''Little Red Riding Hood,'' and ''Snow White.'' In making our case for endogenous surprise, we first endeavored to establish that the Repetition-Break plot is not a rare exception but is used consistently in this canonical collection of folktales.

The folktale collection of the Grimm brothers also contains another feature that makes it an interesting domain to analyze the value of surprise in the social marketplace of ideas. The Grimm brothers included both tales that primarily existed in an oral tradition, passed from person to person verbally, and others that were originally passed along in writing. Oral traditions provide stronger selection pressures than written traditions—they require generations of people to like the tale well enough to pass it along, and to remember it well enough to tell it coherently (for a broader examination of the cognitive psychology of oral tales, see Rubin, 1995). In contrast, a written tale must just be set down once, and so relies more on people's awareness and access to copies than their memory and ability to retell it. Oral traditions also place greater burdens on working memory; listeners cannot go back and revisit an earlier part of the story if it was not immediately clear. Based on the greater selection pressures and working memory demands for oral folktales, if the Repetition-Break plot aids comprehension and liking, it should be particularly pronounced among oral tales. Because the Grimm brothers' collection has been well studied, we have information about which stories they originally collected from oral sources and which from written sources.

In our corpus analysis, we took a stratified random sample of Grimm folktales from oral and written sources and analyzed them for the use of the Repetition-Break plot. We also coded for repetition without a break (i.e., without a contrasting final event) as a control for the use of repetition alone as a memory aid. In addition, we coded the number of events in each plot structure. Three is the minimal number of events needed to generate the Repetition-Break plot structure, but the structure allows for more than two initial events.

We suspected that its use would not be limited to three events, but that it would trend toward this minimal number, particularly among oral tales, to ease memory burdens.

One problem with most collections of folklore is that they almost never indicate how frequently various stories appear in culture. Folklore collectors are like butterfly collectors—they want to collect one of each species regardless of how rare or common it is. But one helpful feature of the Grimm brothers' collection allows us to partially address how frequently Repetition-Break folktales were in 18th-century German culture. The Grimm brothers published multiple versions of their collection, and they omitted some folktales from their final edition that they had included in earlier editions. These were omitted for various reasons, including that they were too gruesome, baroque, allegorical, more of a legend than a folktale, or insufficiently German. But a few of the folktales were omitted because they were too similar to folktales they had included in another version. If the stories omitted for being too similar were likely to have Repetition-Break plots, this would be evidence that folktales with Repetition-Break plots appeared more frequently in the culture.

As a second source of data on frequency, we estimated the current cultural prevalence of the Grimm folktales. We could do so because the Grimm folktales have canonical titles. We follow Norenzayan, Atran, Faulkner, & Schaller (2006) in comparing Google's estimated number of search results (''hits'') for Grimm folktale titles as a proxy for how often the folktales are discussed today. We predicted that on average, folktales with Repetition-Break plots, relative to those without, would have more search results. This finding would imply Repetition-Break plots engender greater cultural use of their stories.

2.1. Methods

2.1.1. Materials

We randomly selected folktales with oral ($n = 44$) and written ($n = 44$) sources as documented by Zipes (2002) and coded them for the presence of various plot structures including Repetition-Break and repetition alone. To ensure that the plot structures were inherent to the folktales and not to a particular translation, one coder rated the 88 folktales included in the Grimm brothers' final edition in two additional translations (Barnes & Noble, 1993; Manheim, 1977). The codings were consistent across the three collections, implying that translator decision-making does not substantially alter the basic plot elements we are examining.

We also coded all 32 folktales that the Grimm brothers omitted from their final edition (Zipes, 2002). Some were omitted from the final Grimm collection because they were too similar to included folktales ($n = 9$), and the rest were omitted for other reasons mentioned previously ($n = 23$).

2.1.2. Coding

We coded each folktale as to whether it used or did not use the Repetition-Break plot structure. We also, as a comparison, coded whether each folktale used repetition alone. Raters determined whether there was a Break by evaluating whether the last item in a sequence differed from the initial items more than the initial items differed from each other.

The most common pattern of Repetition-Break was as follows: failed attempt, failed attempt, (failed attempt…), success, although there were many other uses, including setting up failure (as described earlier in ''The Three Little Pigs,'' where the wolf succeeds, succeeds, then fails). Coders also recorded the number of events in the plot structures. For example, if a story described how a series of three knights failed to rescue a princess, who was then rescued by a shepherd boy, this would have been recorded as an instance of the Repetition-Break plot, composed of four events.

One coder (the first author) rated every folktale. A second coder (a graduate research assistant) rated half the folktales, randomly drawn from all three sources (oral, written, and omitted). Levels of agreement were high for both Repetition-Break ($\kappa = .84$) and repetition alone ($\kappa = .82$), and when the raters agreed on the kind of structure present, they were nearly always (93%) in agreement about its number of events.

2.1.3. Google searches

Following the methods of Norenzayan, Atran, Faulkner, & Schaller (2006), we generated two Google searches for each folktale—one for each tale's German and translated English title, both combined with the word ''Grimm''—for the 88 folktales included in the final edition. We then summed each pair of estimated numbers of search results. And we likewise followed them in dropping from analysis the titles that were very short and used common words (e.g., ''the rose,'' ''the nail''), as they were likely to be inflated by spurious results. Finally, we ran our analyses on log-transformed data because the distributions were strongly skewed, although in presenting the data in the Results section we use the raw search counts for ease of comprehension.

2.2. Results

Examining the folktales included in the final edition, just over half, 53% (47/88), used the Repetition-Break plot structure. In contrast, just 19% (17/88) used repetition alone, a clear difference, $\chi^2 = 22.10$, $p < .0001$. Thus the Repetition-Break plot was quite common, and most of the occurrences of repetition were in the service of setting up a break.

As predicted, use of the Repetition-Break plot structure differed by story origin. It was present in a greater proportion of oral tales (68%, 30/44) than written tales (39%, 17/44), $\chi^2 = 7.72$, $p = .006$. There was little difference in the use of repetition alone between oral (20%) and written (14%) folktales. Thus, the Repetition-Break plot, specifically, is common in oral transmission.

The Repetition-Break plot structure requires at least three events—two similar events followed by a contrasting one. But in principle it can accommodate more than two initial events. We found folktales with two to six initial events. Most had two initial events (73%) and each successive number was represented by fewer tales. Folktales with oral origins were particularly likely to have two initial events (81%, 42/52), whereas those with written origins (57%, 13/23) were more variable, $\chi^2 = 4.79$, $p = .03$. The stories that used repetition alone also varied in the number of events in their sequences, ranging from 3 to 12. Most sequences had three events (59%), with fewer instances the higher the number of repetitions.

The coding of omitted folktales provided additional evidence that the Repetition-Break plot structure provides an advantage for folktales. Of the tales omitted by the Grimm brothers because they were too similar to the stories they included, 67% (6/9) included the Repetition-Break plot. In contrast, of the folktales they omitted for other reasons, just 26% (6/23) used the Repetition-Break plot, which is reliably less often by Fisher's exact test, $p < .05$. This is evidence that Repetition-Break plots may lead folktales to appear more frequently in a population.

As further evidence of an effect on cultural frequency, our analysis of the Google search results for folktale titles showed a frequency advantage for folktales with Repetition-Break plots. Titles from folktales with Repetition-Break plots had more search results ($M = 23,716$, $SD = 40,164$) than titles from folktales without such plots ($M = 6,764$, $SD = 11,194$), $t(77) = 2.13$, $p = .04$. Thus, not only does a substantial proportion of folktales from the Grimm collection make use of the Repetition-Break plot structure, but those that do are more widespread in culture.

2.3. Discussion

Examining the canonical collection of Western folktales collected by the Grimm brothers, we found that the Repetition-Break plot structure is quite commonly used, appearing in about half the folktales. The structure was particularly common in oral folktales and was less common in written folktales (though still over one third). Further, the folktales with Repetition-Break plots, compared to those without, had greater numbers of Google search results. This implies that not only may there be many such folktales to choose from, but that tales with this plot structure are more likely to be culturally selected.

The greater prevalence of Repetition-Break in oral folktales is likely to be, at least in part, a memory effect. The move to a written medium might diminish the need for the structure because written folktales impose lower memory demands, and therefore may enhance the survival of stories with other structures. But memory effects do not completely account for the pattern of data. Repetition alone should ease working memory limitations for comprehension and increase long-term memory for the folktales. But the primary use of repetition in these stories was to support the Repetition-Break plot: three out of every four instances of repetition were to set up a break. This suggests that the Repetition-Break plot may have other functions, and a primary candidate is interest and liking. Our subsequent studies will address more directly the role of liking in perpetuating the Repetition-Break plot.

Despite our findings that show the Repetition-Break plot structure is prevalent, to our knowledge previous folklore researchers have not discussed this pattern. Plot structures discussed within the folklore community tend to be less abstract than the Repetition-Break plot structure—plot elements are generally examined with respect to specific actors and situation types (e.g., Vladimir Propp's analyses of Russian folktale phases, such as ''hero returns''; or the Aarne-Thompson typology, such as ''lowly heroine marries Prince''). We could find no mentions of the Repetition-Break plot in the literature, and when we contacted half a dozen folklore experts, including a translator of the Grimm collection, all raised the importance of

repetition, but none described the Repetition-Break plot. This is particularly striking because use of the Repetition-Break plot is not idiosyncratic to the Grimm collection.

2.4. Supplementary analyses

We completed three additional corpus analyses on narratives from non-Western sources. First, we analyzed a set of myths used by Levi-Strauss (1969) in his *Mythologique*. We identified one of the few sets of myths he drew from that was both large and published in English, a collection of Huron-Wyandot narratives gathered and transcribed directly from Huron-Wyandot sources in 1911–1912 (Barbeau, 1960). We coded all 40 stories in the collection for use of the Repetition-Break plot ($\kappa = .83$) and repetition alone ($\kappa = .63$). We found that 35% used the Repetition-Break plot and 8% used repetition alone, a reliable difference, $\chi^2 = 9.04$, $p < .01$. This replicates the general pattern in the Grimm folktale collection.

Second, we analyzed a set of Tibetan folktales (Chophel, 1984). These stories were collected by a Tibetan from Tibetan villagers and published by an organization dedicated to the preservation of Tibetan culture founded by the Dalai Lama. We coded all 28 folktales for Repetition-Break plots ($\kappa = .78$) and for repetition alone ($\kappa = .67$). In this collection, 61% used the Repetition-Break plot and 14% used repetition alone, $\chi^2 = 12.88$, $p < .001$. This is further support for the widespread use of the Repetition-Break plot structure.

Finally, we analyzed a randomly drawn selection of 60 stories from a diverse sample of folktales from various cultures and historical time periods: Jane Yolen's (1986) *Folktales From Around the World*. These folktales were from nations and cultures spanning the globe, both Western (e.g., England, France, Italy, Russia and Sweden) and non-Western (e.g., Ashanti [West African], Blood-Piegan [Native American], Burma, China, and Afghanistan). We found that 38% of the sample used the Repetition-Break plot (including instances from all of the cultures just listed). The rate of using the Repetition-Break plot among Western (41%) and non-Western (27%) cultures was not reliably different, $\chi^2 = 1.32$, $p = .25$.

We conclude that the prevalence of the Repetition-Break plot in cultural narratives (folktales and myths) is not simply due to an idiosyncrasy of Western traditions, or the Grimm's selection process. Nor is it likely that Repetition-Break plots are prevalent because of the actions of editors and translators, given how substantial the changes would need to be and given their frequent use in the Tibetan collection, which had the least Western influence in its construction of any of our samples. We also stress that we do not claim that the Repetition-Break plot is universally used, nor do we claim that all cultures use it equally often. Rather, we conclude simply that the Repetition-Break plot enjoys widespread use in narratives from multiple cultures.

3. Study 2: Corpus analysis of joke plot structures

As with folktales, the Repetition-Break plot structure seems present in at least some jokes. There are standard joke forms that use it—such as ''three guys walk into a bar…'' or

''a priest, a minister and a rabbi are standing at the gates of heaven…''—in which the first two characters set a pattern for the third to break. As suggested by previous work on memory, the surprise fostered by the Repetition-Break plot should enhance memory for jokes that use it. But as in folktales, the Repetition-Break plot may also increase liking and thus affect people's willingness to retell it. Because humor relies at least in part on novelty and surprise, a structure that can create a novel pattern and (mis-)direct attention should be valuable.

To examine whether the Repetition-Break plot structure is prevalent, we gathered a sample of jokes from Jokes.Com, a database run by Comedy Central, which is one of the largest databases available. A crucial feature of this database is that, unlike the edited compilations of folktales, this collection of jokes has been amassed from its many users, any of whom could submit an entry. Thus, this collection, unlike the folktales, does not represent the work of one key editor. In addition, because the website allows its users to rate the jokes, and lists their average ratings, we have a direct test of liking. We examined whether the jokes with the Repetition-Shift plot were better liked than other jokes.

3.1. Methods

We downloaded 220 jokes and their mean ratings by website visitors from Jokes.Com. We constrained our search to story jokes, as opposed to puns, satires, one-liners, top ten lists, and so forth. We drew from the ''miscellaneous'' category so as not to be limited to one particular content area (e.g., lawyers, bars, or politics). Finally, we limited ourselves to clean jokes to avoid offending our raters. We took an initial sample ($n = 174$) of all available jokes, then later supplemented it with additional jokes at the low and high ends of the rating scale; though even after supplementing, the top and bottom rating levels had small sample sizes (as noted at the bottom of Fig. 1; dropping the top and bottom ratings from analysis led to the same pattern of statistical significance). Jokes.Com asks readers to rate
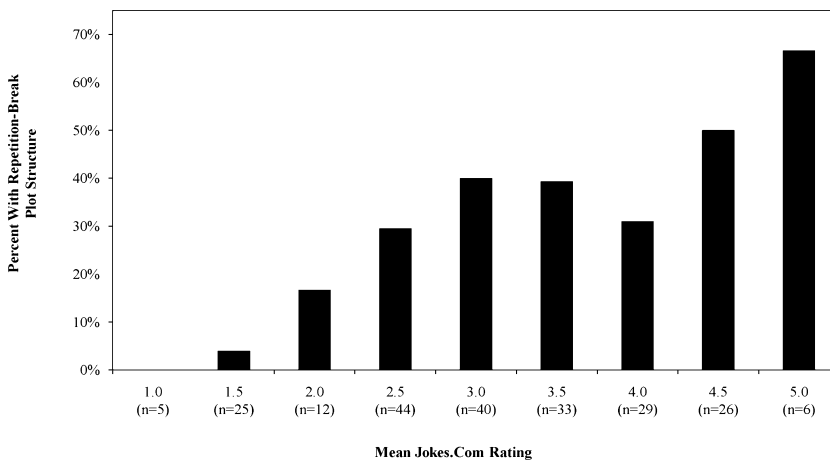

Fig. 1. The percent of jokes using the Repetition-Break plot structure by mean Jokes.Com rating.

jokes on a 5-point scale (5 = ''hysterical,'' 1 = ''blows''), and mean ratings were given in 0.5 increments. We had each joke coded by two graduate student raters for the presence or absence of the Repetition-Break plot (κ = .79).

3.2. Results and discussion

We tested both whether jokes with Repetition-Break plots were prevalent and whether they were liked. First, consistent with our predictions, the structure was quite prevalent. We found that 32% (71/220) of the jokes used the Repetition-Break plot structure (the 95% confidence interval for the proportion ranged from 26% to 39%). Thus, consistent with our predictions, the structure was quite prevalent in this user-generated database of jokes.

Second, we tested how the Repetition-Break plot affected liking. The mean liking for jokes with the Repetition-Break plot (3.47) was greater than the mean liking for jokes without the structure (2.88), $t(218)$ = 4.30, p < .0001. Fig. 1 provides another way of looking at the data. The proportion of jokes with the Repetition-Break plot increases as the mean liking rating increases. A simple correlation provides a measure of the magnitude of the relationship, r_s (n = 220) = .26, p < .0001, while a binomial logistic regression, entering in each joke as an independent observation, shows that rating is a reliable predictor of having the Repetition-Break plot, B = .643, SE = .168, Wald χ^2 = 14.70, p = .0001, R^2 = .07. Thus, Jokes.Com visitors liked jokes with the Repetition-Break plot more than jokes without it.

The main advantages of the Jokes.Com site were the user-generated set of jokes and the availability of liking ratings. We also investigated the prevalence of the Repetition-Break plot in a more exhaustive, edited collection of jokes. Milton Berle was a lifelong collector of jokes; he published two volumes with over 20,000 of the jokes that he gathered over the course of his long career from a host of other comedians. Berle's is arguably the largest and best-known collection of jokes by a comedian. These jokes can be roughly characterized as brief quips and story jokes. We simply ignored the quips and drew a sample of 60 of the longer jokes (those at least six lines long) from Berle (1989). We found that 30% used the Repetition-Break plot, confirming that the structure appears frequently in jokes.

Comedians, unlike folklorists, talk about something like the Repetition-Break plot. This is ''the law of threes,'' which refers to many things (e.g., tell three jokes on the same topic then switch topics), but at least one of its meanings overlaps with the Repetition-Break plot, ''setup, setup, punch line.'' This can mean a three-event Repetition-Break plot, but it can also mean, ''talk about the context, talk about the context, tell the punch line.''

As in the previous study of folktales, we find the Repetition-Break plot to be common in jokes, present in about one third of two very different kinds of samples. Further, in this study, we were able to show that the Repetition-Break plot affects liking.

4. Study 3: Experimental manipulation of plot structures

Given the substantial prevalence of the Repetition-Break plot structure in different domains of culture, and the preliminary evidence from Jokes.Com that jokes with

Table 1
Example of joke structures for Study 3

A rabbit is hopping happily through the forest. On his way, he meets a giraffe **who is about to smoke marijuana. The rabbit says to the giraffe, ''Giraffe, you shouldn't pollute your neck and hurt your lungs inhaling that harmful stuff! Let's breathe in the fresh air as we jog through the forest.'' The giraffe pauses, drops the marijuana, and follows the rabbit**.
A little further through the forest, they meet an elephant about to snort cocaine. The rabbit says to the elephant, ''Elephant, why do you want to ruin your precious trunk with that sinful powder? Sniff the spring flowers instead. Come jog with us and enjoy Mother Nature.'' The elephant spills out the cocaine and jogs with the rabbit and giraffe.
Then they meet a lion who is about to use heroin. The rabbit says to the lion, ''Lion, you're the king of the forest! Isn't that enough of a ''high'' for you? Join us for an invigorating jog together through the beautiful forest.''
The lion puts down the heroin and punches the rabbit on the nose. The giraffe and the elephant exclaim, ''Why do you beat him? He is so nice.'' The lion answers angrily, ''Such a hooligan rabbit. Every time he takes Ecstasy, he convinces me to run with him in the forest like an idiot.''

Note: Plain text only is the Baseline version. Bold and plain text is the Contrast version. Bold, underlined, and plain text is the Repetition-Break version.

Repetition-Break plots were evaluated more favorably, we wanted to look in more detail at whether this structure indeed produces greater interest and liking for cultural products that feature it. As a context for manipulating the Repetition-Break structure, we chose jokes because they are short, have simple plots, and lend themselves to writing variants.

We were interested in examining the creation of endogenous surprise. Learning research suggests the initial repetition can establish a novel expectation and hence generate surprise. Thus, we were interested in whether removing the initial repetition would decrease people's liking of the jokes. If the initial Repetition allows listeners to develop a stronger expectation, which is then violated by the final Break, then the Repetition should be important in producing the surprise that leads people to like the joke. In addition to these two versions of each joke (a Repetition-Break and a Contrast version with only one initial event), we generated a third version with no initial repetition (Table 1). This ''Baseline'' provided a sparse setup, then the final event and punch line. It serves as a control for whether the final event and punch line are likeable on their own, without any setup at all. Our prediction was straightforward: participants should prefer Repetition-Break jokes to Contrast jokes, and prefer Contrasts to Baseline versions.

4.1. Methods

4.1.1. Participants
A total of 117 undergraduates (63% female) at a large state university participated for course extra credit as part of an introductory survey course on management.

4.1.2. Materials and procedure
We presented people with five jokes. Two were fillers with plot structures not involving repetition. To ensure the originality of the three key jokes, they were obtained from Chinese

joke websites and then translated into English. They were chosen based on whether they established novel expectations, rather than playing off cultural stereotypes (lawyers are greedy, etc., as was commonly the case in the Jokes.Com items). We wrote four versions of each joke: the Repetition-Break version, two Contrast versions (each had one initial event, selected from the two or more repetitions in the Repetition-Break version), and the Baseline version (with no initial event, just some sparse setup and the final event and punch line). Across participants, each joke was shown in every version. Each participant only read one Repetition-Break joke, one Contrast joke, and one Baseline joke.

People read the jokes in unique random orders. Each joke was presented on a computer a sentence or two at a time, for a fixed amount of time selected to give participants about 250 ms per word to read them. This was pilot-tested to provide enough time to read the sentences but not so much time as to cause boredom. After the end of the joke, participants were asked ''Did you like the joke? Was it funny, interesting, surprising or memorable in any way?'' They selected a number from 1 ''I really disliked it'' to 4 ''It was fair'' to 7 ''I really liked it.''

4.2. Results and discussion

The Repetition-Break plot was clearly preferred overall. A mixed-measures ANOVA showed a clear effect of joke structure, $F(2,325) = 14.91$, $p < .001$ (see Fig. 2). Bonferroni-adjusted contrast tests showed that jokes with the Repetition-Break plot structure ($M = 4.69$, $SEM = .23$) were preferred over jokes with a Contrast structure ($M = 3.59$, $SEM = .16$), $p < .001$, which in turn were preferred over the Baseline version of the jokes with no initial events ($M = 2.98$, $SEM = .21$), $p = .046$. All three jokes showed the same ordinal pattern.

This experiment lends further support for our claim that the Repetition-Break plot is effective for conveying novel expectations to enable surprise that interests people. Based on the research into category and schema learning discussed earlier, we suggest that the initial
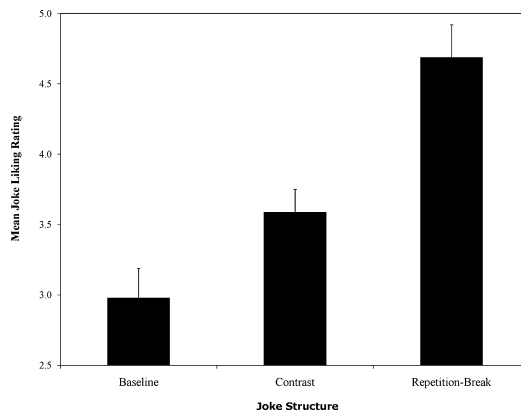

Fig. 2. Mean liking ratings by joke structure in Study 3 (error bars are 1 *SEM*).

repetition clarified the expectations these readers had about what was coming next, thereby strengthening their feelings of surprise and interest when the next event diverged from their newly formed expectation. Accordingly, we found that the Repetition-Break versions were preferred over the contrast versions, consistent with the claim that an initial comparison would aid in establishing an expectation. The baseline versions were least liked, suggesting that the Repetition-Break jokes were not effective due to inherently interesting joke endings.

We conducted a range of additional pilot studies with the joke materials for robustness, and note three suggestive findings about what was important for finding a plot structure effect. First, we found that stereotypical jokes (from Jokes.Com) showed little difference between Repetition-Break and contrast structures for participants who were familiar with the stereotypes. This is consistent with the underlying psychological theorizing that the repetition should primarily be useful for establishing a novel generalization. Second, we found that participants rated jokes more highly, and preferred the Repetition-Break version over the contrast version more strongly, if they saw them a line or two at a time, or heard them read aloud by an actor, relative to simply reading the entire joke at once. This implies that the Repetition-Break plot structure is particularly effective when people have to maintain a story in memory, and hence is consistent with the finding of greater use of the Repetition-Break plot in folktales with oral rather than literary sources. Third, we found that reading many Repetition-Break and contrast jokes in a row diminishes their ratings and the difference in ratings between the two plot structures. We think this suggests a structural priming effect (cf. Bock & Griffin, 2000) enabling people to expect the ''break,'' thereby diminishing its surprise. More speculatively, it also suggests a potential limit on the use of the Repetition-Break plot within a set of stories, as the structure will have diminishing effectiveness to generate surprise.

5. General discussion

Our research highlights a new way in which surprise influences the selection of cultural products. Previous work has focused on a particular kind of surprise, one generated by examples that violate deep underlying intuitions about the behavior of natural, animal, and human systems. In this paper we have examined a very different kind of surprise, generated by events that in themselves may be uninteresting, but because of their role within a plot structure, are unexpected. The broad implication is that surprise is a sufficiently important mechanism underlying memory and transmission that cultural products will endogenously produce it.

Our investigations of folktales and jokes suggest that that the Repetition-Break plot structure has become widespread—characteristic of one third to two thirds of the samples we looked at. The Repetition-Break plot appears to be a recipe for structuring information to make it memorable and to induce surprise and interest, and thereby confer advantages for selection in the marketplace of ideas.

Previous research into category and schema learning implied that the Repetition-Break plot structure would be easily understood and well remembered. We further claimed that

the Repetition-Break structure would enhance liking. Because it is a *plot* structure, with the Break playing a special role in a story, we suspected that Repetition-Break plots would be more likely to engender surprise and liking. Our experiment found evidence consistent with this claim. Because the initial repetition creates an expectation endogenously, the Break can create surprise, even for novices who do not have previous experience with the culture. This may be why there are so many examples of the Repetition-Break plot in stories for young children—and more generally why further research linking what is easily learnable to what is culturally prevalent should probably start with cultural products directed at children (Hirschfield, 2002). Children are ideal cultural learners.

Our research suggests that the Repetition-Break plot structure provides a powerful recipe for creating the kinds of surprise that leads a cultural product to endure. But although this structure seems to regularly evolve in cultural products, there is no reason to leave its use to a blind process of variation and selection. If generating surprise is an effective strategy for attracting interest in important messages, then teachers in, say, a science class might productively put the Repetition-Break plot to good use in conveying insights about science, not merely jokes about three guys walking into a bar.

5.1. Additional areas of research

We believe there is more to investigate concerning the Repetition-Break plot structure. Across the many instances that we examined, we noticed what might be several subtypes to the Repetition-Break plot. Sometimes the Break is to an event that differs from the pattern established by the initial repetition. Here the initial repetition functions to direct attention away from where it will need to end up. It can also be used to do something otherwise difficult, which is to make a novel nonevent surprising (e.g., the third little pig's brick house does not fall down when the wolf blows it). In other examples of the Repetition-Break plot, the Break is to an event that is, surprisingly, the same as those in the initial repetition. This is a progressive alignment effect (Kotovsky & Gentner, 1996) in which the use of the initial repetition encourages people to notice a pattern that can then be perceived to apply to a new instance, suggesting a novel interpretation for it. Another sort of difference we have noted is that in some examples, the final event is self-explanatory, and in other examples it establishes a puzzle that is then explained or resolved. A final note is that we have not clearly explained why the initial repetition can include different numbers of events. There is likely some pressure toward compactness, which would lead to the fewest initial events, namely two. But there is also some use for adding initial events, such as heightening tension and producing variation to maintain the plot structure's power to surprise.

A further arena of interest is visual uses of the Repetition-Break plot structure. In addition to the corpus analyses of jokes and folktales, we have examined large corpora of advertisements (full-page magazine advertisements and television spots) and political cartoons as additional cultural products that must compete strongly for the attention of the public. After examining hundreds of examples of each, we found about 10% used Repetition-Break plots. This is a lower rate of use than we found in folktales and jokes, and we suspect that this may be because visual media provide many ways to convey a message other than the

sequencing of events (including the von Restorff effect, which says that an item is more memorable when it stands out in some distinctive visual way). But it is also clear that the Repetition-Break plot is used within these media. One of the most successful advertising campaigns in the previous dozen years is Mastercard's ''priceless'' campaign, which uses the Repetition-Break plot. For example: ''18-speed bike: $1,235. Shipping bike to Italy: $281. Map of Tuscany: 4,000 lira. Seven days without e-mail: priceless.'' Discussions with people at the advertising agency that created MasterCard's campaign suggested that they clearly understand the structure of their advertisements. They said that they wanted the initial items as a sort of ''laundry list,'' and that having three such items would make it feel complete so that the ''priceless'' line could ''pull the rug out from under people.'' However, our discussions also suggested that they did not identify the advertisements' plot as a general structure that they notice and use in other campaigns. Even so, it is intriguing that our sample of magazine advertisements showed that the use of Repetition-Break plots increased roughly fivefold over the past 15 years relative to the previous 60 years, perhaps representing a form of cultural learning.

6. Conclusion

We have demonstrated that psychological research about what facilitates learning can produce testable claims about the effectiveness and prevalence of cultural products. We do not claim to have explained all uses of surprise, nor all story structures (of which there are many in need of psychological explanations, e.g., Goldenberg, Mazursky, & Solomon, 1999). We have proposed, explained, documented, and found experimental support for one, the Repetition-Break plot structure.

Unlike other social sciences such as sociology and anthropology, psychology has not had a longstanding interest in explaining cultural phenomenon. We believe this is unfortunate. As with David Rubin's (1995) brilliant book on oral traditions in epic poetry and folk ballads, and as with the other research we have cited on the prevalence of counterintuitive cultural beliefs (e.g., Barret & Nyhof, 2001; Boyer & Ramble, 2001; Norenzayan, Atran, Faulkner, & Schaller, 2006), we think the research in this article shows the power of applying principles of cognitive science to studying the diffusion of cultural ideas (see also Berger & Heath, 2005). If culture is the product of cognition and communication, then only by using what we know about cognition and communication will we understand why cultural ideas survive and spread.

Note

1. Dedre Gentner first called attention to this connection; she named the dollhouse study by Loewenstein and Gentner (2001) (the one described in the Introduction), which used the Repetition-Break structure in one condition, ''the Billy Goats Gruff study.''

Acknowledgments

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